

CARVALHOMA (HEMIPTERA: MIRIDAE):
REVISED SUBFAMILY PLACEMENT

RANDALL T. SCHUH AND MICHAEL D. SCHWARTZ

Department of Entomology, American Museum of Natural History,
New York, New York 10024

Abstract.—*Carvalhoma* Slater and Gross is transferred from the Phylinae to the Cylapinae. The nymphal and adult male habitus, male genitalia, and claws of *Carvalhoma malcolmae* Slater and Gross are figured. Characters used to determine subfamily placement are discussed, and it is suggested that the Cylapinae, Isometopinae, and *Psallops* Usinger form a monophyletic group.

Slater and Gross (1977) described from Australia two species of *Carvalhoma* on the basis of female specimens. They placed the genus in the mirid subfamily Phylinae on the basis of its hairlike (setiform) parempodia, simple sclerotized rings, and the narrow straplike interramal sclerites in the female. We question the correctness of this subfamilial assignment for the following reasons: the habitus of *Carvalhoma* is unusual in the Phylinae; setiform parempodia occur in cylapine, deraeocorine, and bryocorine mirids in addition to the Phylinae and are therefore not diagnostic of any one of these groups; and the simple structure of the female genitalia illustrated by Slater and Gross is not necessarily diagnostic for the Phylinae. We have examined a male specimen of *Carvalhoma malcolmae* collected in forest litter at Talbingo Mountain, 47.8 km S of Tumut, New South Wales, Australia, on April 3, 1976. The specimen is illustrated in Figure 1. The nymph is illustrated in Figure 2. The male of *C. malcolmae* is similar in appearance to the female as illustrated by Slater and Gross (1977) but has a slightly more elongate and swollen pronotum and somewhat differently shaped hemelytra which cover less of the abdomen. We have studied the pretarsal structures (Figs. 3, 4) and male genitalia in detail (Figs. 5-9). We believe our examination supports placement of *Carvalhoma* in the subfamily Cylapinae (we have tentatively placed it in the tribe Cylapini based on the structure of the head and the condition of the ostiolar peritreme which is without an ocelloid shining tubercle). Our reasons are as follows.

1. The claws are elongate and slender and lack pulvilli, attributes which, in conjunction with the setiform parempodia, have traditionally been used to diagnose the Cylapinae. None of these pretarsal characteristics is unique to the Cylapinae, however, and therefore do not provide suitable defining characters for the group. The one unique structural detail of the pretarsus of *Carvalhoma* and all other cylapines of which we are aware is the subapical tooth, seen in Figures 3 and 4. This feature has been illustrated by Knight (1918), Carvalho (1955), and Schuh (1976), but was not observed in *Carvalhoma* by Slater and Gross. A similar claw structure occurs in the Isometopinae as shown by McAtee and Malloch (1924) and Schuh (1976) and in *Psallops* Usinger as shown by Schuh (1976), strongly suggesting that these three groups together form a monophyletic unit in the Miridae. The strength of this argument lies

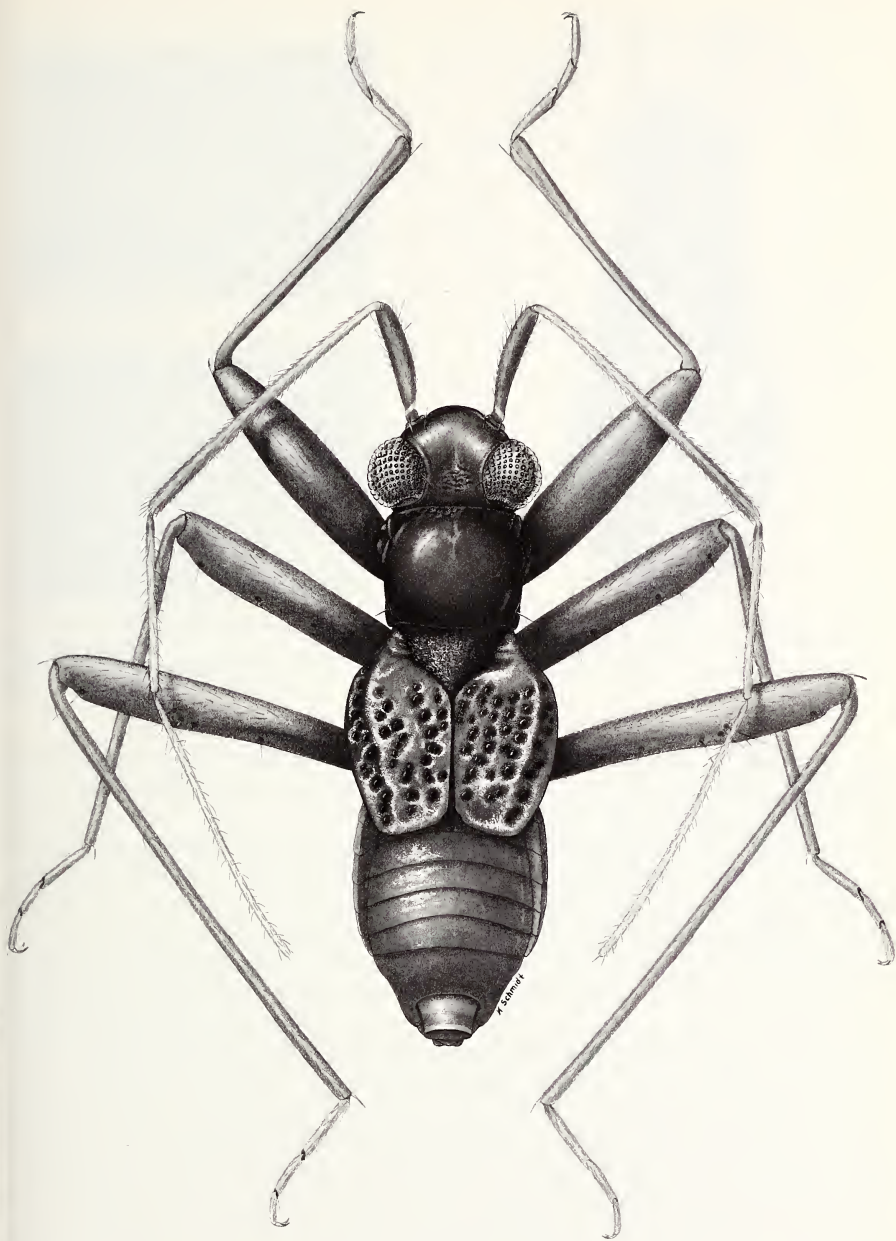
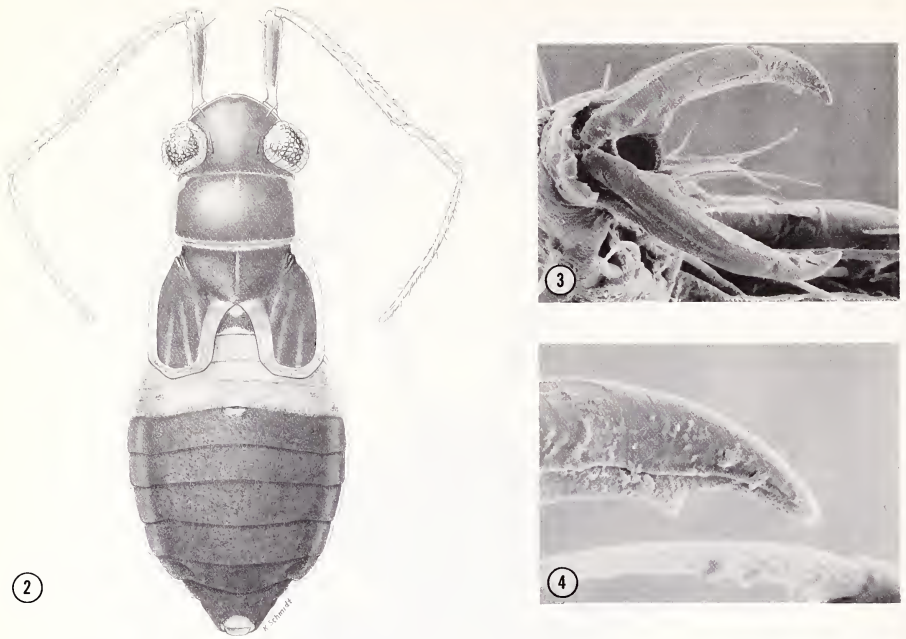


Fig. 1. *Carvalhoma malcolmae*. Adult male, dorsal view.

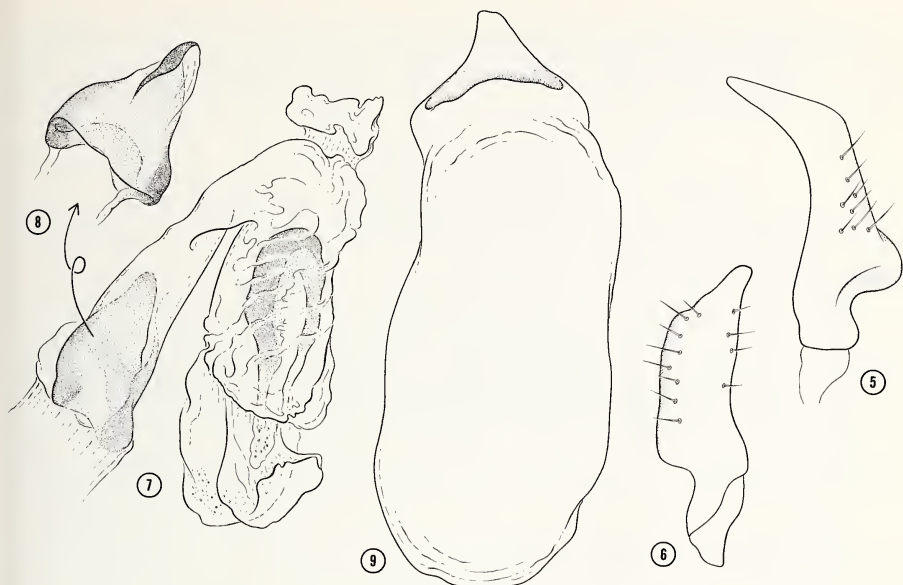


Figs. 2-4. *Carvalhoma malcolmae*. 2. Nymph, dorsal view. 3. Pretarsus. 4. Detail of claw.

in the fact that the subapical tooth occurs only in the Miridae and does not occur in those subfamilies and/or tribes of Miridae which have been recognized as monophyletic on the basis of other characters.

2. The Phylinae are recognized by the unique structure of the male genitalia, with the straplike vesica, the phallosheca attached to the posterior wall of the genital capsule (rather than the phallobase which is the condition in all other Miridae), and the characteristic shape of the left clasper, which supports the phallosheca in repose. The male genitalia of *Carvalhoma malcolmae* are clearly unlike those of any Phylinae and appear not to have been derived from a phylina type. The parameres (Figs. 5, 6) are of a form similar to that found in some Cylapinae (see Carvalho and Lorenzato, 1978, and Carvalho, 1982) and in some Isometopinae (see Slater and Schuh, 1969). In *C. malcolmae* the right and left parameres are almost identical in shape and size, whereas in some cylapines (e.g., *Fulvius* spp.) the right paramere is extremely small. The membranous vesica (Fig. 7) is of a type found in many cylapines (see Carvalho and Lorenzato, 1978) and is similar in structure to that of some other non-phylina Miridae. The small membranous vesica of *malcolmae* has a large secondary gonopore (as also occurs in species of *Cylapocerus* and *Peltidocylapus* [Carvalho and Fontes, 1968]) with an additional heavily sclerotized ringlike structure basad of it which surrounds the ductus seminis (Fig. 8). The phallosheca surrounds the vesica and is attached to the phallobase; the dorsal surface is sclerotized and tapering distally; the ventral surface is membranous (Fig. 9).

3. The structure of the head, with its protruding eyes and depressed vertex, and



Figs. 5-9. *Carvalhoma malcolmae*. 5. Left paramere, lateral view. 6. Right paramere, lateral view. 7. Vesica, dorsal view. 8. Ring-like structure of vesica, ventral view. 9. Phallosome, ventral view.

the very long appendages, appear to be a synapomorphy for *Carvalhoma* with some mirid taxa placed in the Cylapinae by Carvalho (1957) (e.g., *Cylapus* Say and *Corcovadocola* Carvalho, the latter also known to dwell in the litter [Carvalho, 1948]).

The characters used by Slater and Gross to assign *Carvalhoma* to the Phylinae are not unique to that group of Miridae. The claws and male genitalia appear to offer a character unique to a grouping of mirid taxa which has not been formally recognized by previous authors. Further study of other characters in the Cylapinae, Isometopinae, and *Psallops*, will help to determine the validity of the theory that these three taxa form a monophyletic group.

Our justification for the subfamilial placement of *Carvalhoma* is based on an interpretation of characters which contradicts the hypothesis of relationships presented by Schuh (1976). In that paper the absence of ocelli was interpreted as a character uniting all Miridae except Isometopinae and the subapical claw tooth was considered to be plesiomorphic within the Miridae and to have been lost in the phylinae-orthotyline and mirine-deraecorine-bryocorine clades. Furthermore, Schuh gave no unequivocal defining characters for *Psallops* or the Cylapinae as groups. A more parsimonious interpretation of character distributions is to lose the ocelli twice and to define a group including Isometopinae, Cylapinae, and *Psallops* on its possession of the subapical claw tooth.

The idea that *Psallops* and Isometopinae are related is not new; it was first suggested by Carvalho (1956) and reassessed by Schuh (1974, 1976). In fact there seems to be

little justification for considering the pronotal collar of Cylapinae as homologous with that found in the Mirinae-Deraeocorinae-Bryocorinae as was done by Schuh (1976); the Bothriomirini lack a pronotal collar, a point overlooked by Schuh, and in addition several orthotyline genera have well developed rounded collars.

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